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AUTHOR Campbell, Clifton P.
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ABSTRACT

Described are the principles and processes of Instructional Systems Development (ISD). The ISD procedures have been used by the military and industry for a number of years, and this report provides a framework designed for a quick understanding of ISD without the need to locate and research voluminous government publications and other references. ISD consists of five major phases: (1) Analysis, (2) Design, (3) Development, (4) Implementation, and (5) Control. The processes represented by this model can be adapted to various instructional programs, and can be used to change and improve ongoing courses and programs as well as to design new systems. An introduction describing ISD, a flow chart model, and separate sections for each phase are found in this report. The document concludes with a selected bibliography, lists of learning categories and guidelines, and a glossary of special terminology. (MP)

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A Systematic Methodology for Instructional Program Planning, Development, Implementation and Evaluation

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
NATIONAL INSTITUTE OF EDUCATION

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Clifton P. Campbell

Dammam, Saudi Arabia

1981

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Preface

This paper may be of assistance to professionals in the Industrial and Technical Education community who need an overview of a systematic methodology for instructional program design, development, implementation and evaluation. It describes an Instructional Systems Development Model which the author has found to be practical and effective based on his experience with its use by the U.S. and Royal Saudi Navies

There is nothing really new about Instructional Systems Development (ISD) procedures. As procedures they have been used by the military and industry for a number of years. Nor is Syscems Development a catchword to suggest something new; at most it is a process for doing something better - better in deliberately attempting to be systematic, analytic and comprehensive. The U.S. Government spent millions to establish ISD and the entire process is documented and available through the government publications listed in the bibliography.

If after reading this paper, you can accept the ISD approach, there is a large selection of fully developed and validated competency based courses prepared by the U.S. Navy and Air Force using ISD methodology "on the shelf" and available for use. These courses have been packaged and are distributed on a non-profit basis by the U.S. Naval Institute and Aerospace Education Foundation.

Course packages contain public domain printed material including texts, workbooks and programmed units, a complete set of instructor materials including a "Plan of Instruction" that specifies all learning objectives. Each package also includes a summary of key elements including a list of equipment essential to the course, plans and parts lists for many of the special devices used in demonstrations and laboratory experiments which form part of the system designs. All non-copyright audiovisual elements utilized in the presentation of a course are included in each package.

Each one of these course packages is the product of thousands of hours of painstaking and highly thoughtful labor on the part of special teams, skilled in the techniques of ISD. Curriculum development, starting from scratch, costs in excess of $4000 per hour of instruction, according to Office of Education estimates. The job can be done, through the adaptation of military materials, for a minute fraction of such costs. As a matter of

fact, current costs to collect and process materials from a typical military course are approximately $50 per hour of instruction. The cost of reproducing these materials, and placing them in civilian classrooms, is approximately $10 per hour of instruction. The point here is that the use of such materials as a course or as resources in developing a course can substantially reduce the cost of producing a competency based program while facilitating the early availability of instructional materials.

It is important to avoid the possible misconception that these materials are a neatly wrapped up package ready for purchase and immediate use by a civilian secondary or post-secondary school population. They must, of course, be edited, refined or revised to meet local needs in order to assure the desired results/outcomes.

Regardless of how good the course package may be, it is important that instructors be involved in adapting or localizing the instructional materials. Such involvement will not only provide a better teaching/learning climate, but also guarantee that the materials are implemented because the instructor has a feeling of authorship. In order for this element of involvement to occur, instructors should thoroughly understand what ISD is all about - that it is not an end in itself, but a means to efficient and effective learning.

Clifton P. Campbell

Introduction

The purpose of this paper is to describe the principles and processes of Instructional Systems Development (ISD). It is intended to provide the reader with the framework for a quick understanding of ISD procedures, without the need to locate and research voluminous government publications and other references.

By definiton, ISD is a deliberate and orderly process for planning, developing, implementing and evaluating instructional programs which ensures that students are taught the knowledge, skills and attitudes essential for successful job performance.

Background. Trends in the field of educational research and instructional technology have pointed the way for improving the development of instructional programs through adherance to structured procedures based upon systems design theory. The systems approach for the development and accomplishment of education and training programs provides a process for gathering and analyzing job data, developing instructional materials and media, conducting instruction and evaluating and improving the effectiveness of instructional programs. This approach is based upon evidence that each task/behavior performed on a job can be identified and analyzed and that appropriate learning objectives and instructional strategies to achieve these objectives can be developed and structured so that instruction[1] will be efficiently and effectively conducted. The application of the systems approach to instructional development ensures that all inter-related factors are considered and that the students, when the instruction is appropriately delivered, will reach performance standards required for specific job entry level proficiency.

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[1]The term instruction can be read as education or training.

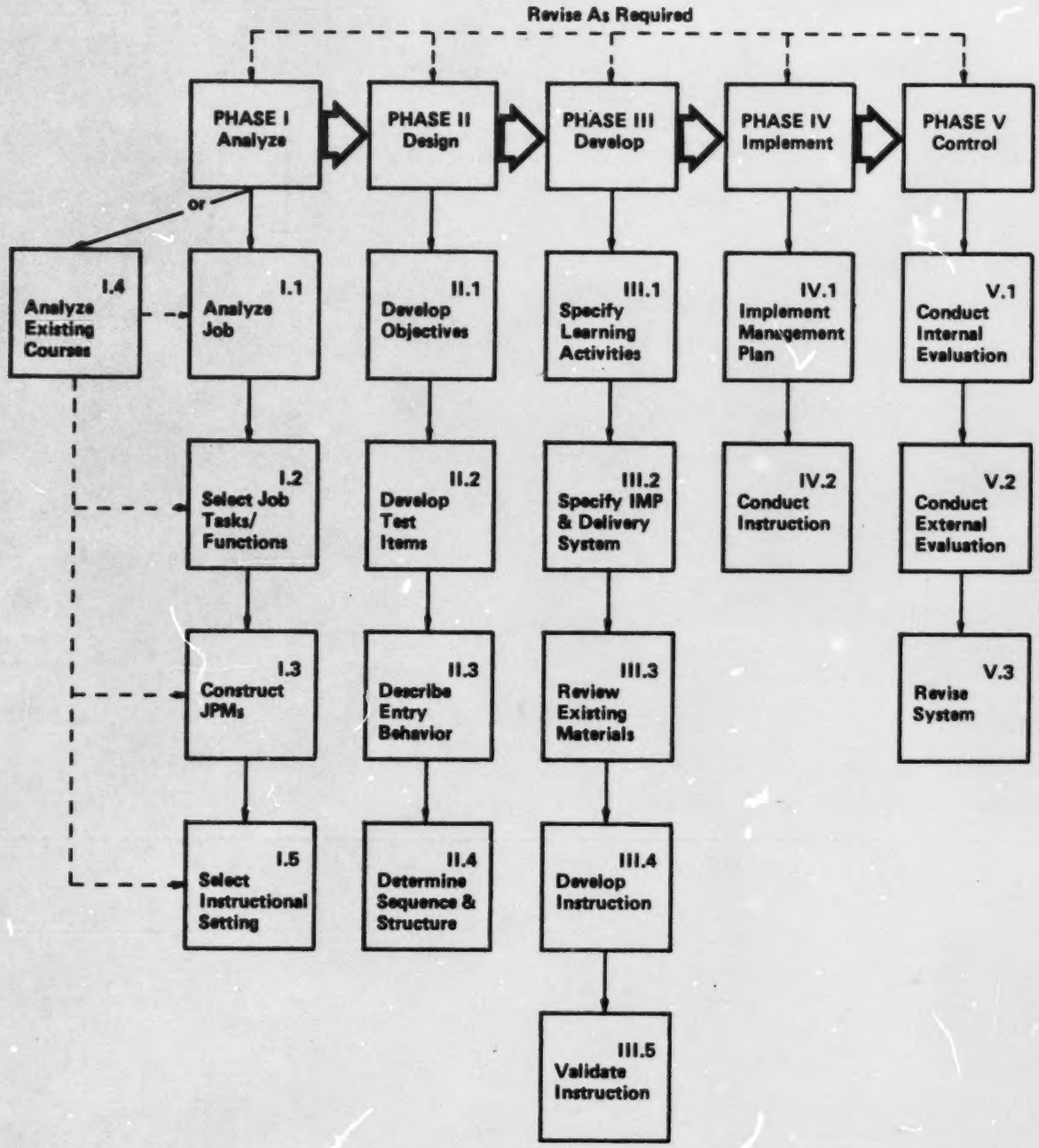
Model for Instructional Systems Development

Instructional Systems Development consists of five major phases: I) Analysis, II) Design, III) Development, IV) Implementation, and V) Control. Each of the phases is a separate and distinct function. The ISD procedural model and flowchart, exhibited in Figure 1, shows these five phases, each of which is further divided into a number of blocks. Symbolically, this figure outlines the recommended sequential relationship of the functional steps. It also illustrates that all parts of the model depend on the other parts, forming a closed loop instructional system.

The process represented by this model can be adapted to various instructional programs. It can be used to change and improve ongoing courses and instructional programs as well as to design new instructional systems (programs).

There are other models with fewer or more phases, but the process involved is basically the same. For local implementation the phases may be subdivided to aid in managing the process. Another form of flexibility is that actions can be performed in several phases simultaneously. The model can also be entered at any phase in the process. Thus, for ongoing instruction one might start the process as a result of internal evaluations (phase V, block 1). The ISD model itself should not be viewed as inviolate, but changeable when evidence and situations indicate the need for adaptation.

The following text and accompanying illustrations compress into a short summary what is involved in each phase of the ISD model.



Source: NAVEDTRA 110, p. ii

FIGURE 1

INSTRUCTIONAL SYSTEMS DEVELOPMENT MODEL AND FLOWCHART

Phase I, Analyze

Before designing and developing instruction it is necessary to establish exactly what constitutes adequate job performance. Job analysis is the basic method for obtaining a detailed list of duties, tasks and elements necessary to perform a clearly defined, specific job. It involves any or all of the techniques of job interviews, questionnaire surveys, jury of experts, observing personnel in the work environment and studying available job information. Regardless of how well all the other procedural events are carried out, if job analysis data are not valid and reliable the resulting instructional program will fail to produce personnel able to perform their duties at an acceptable level.

Some tasks are seldom required on the job and only minimum job degradation would result if they were not performed. However, other tasks may be highly critical to successful job performance, and the complex nature of the task makes instruction essential. Economic, time and other considerations require a decision as to which tasks will be selected for instruction and which will not. Selection criteria and information collected during the job analysis are used in making this decision.

Job performance measures are developed for all tasks selected for instruction. In addition to evaluating a job incumbent's task proficiency, job performance measures are used in writing learning objectives (block II.1), in preparing test items (block II.2) and in measuring student performance on the job (block V.2). It is generally agreed that this is the most reliable tool available for ensuring that students are taught to the conditions and standards of the job.

In order to avoid unnecessary duplication of effort and take advantage of prior work done, existing course documentation and other available material should be examined. This effort may reveal that all or

portions of the analysis and other phases have already been done by someone else.

As a final step in phase I, the tasks selected for instruction are analyzed in order to identify the most appropriate instructional setting(s), e.g., classroom and/or shop instruction, on-the-job training, etc. The optimal setting is the one that provides the necessary equipment, facilities and personnel as well as the most effective and efficient training. It should be noted, however, that trade-offs are frequently made based on resource availability and other constraints.

Figure 2 shows the sequence of events required in the analysis phase of course development. Event outputs are listed alongside in terms of products.

EVENTS:

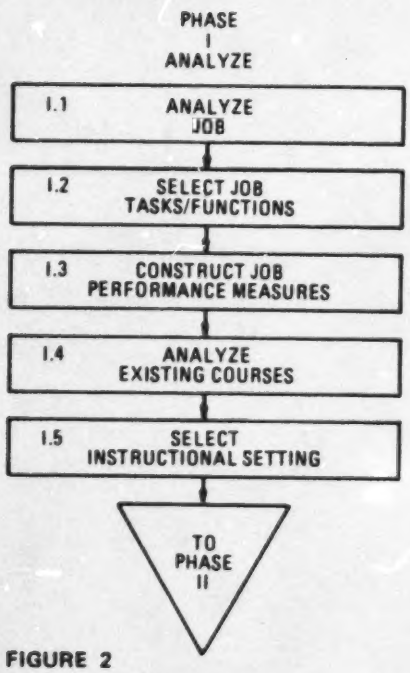


FIGURE 2

PRODUCTS:

I.1 a list of job tasks, the equipment and or materials involved, the conditions and standards of performance, etc.

I.2 a list of tasks selected for instruction

I.3 a validated job performance measure for each task selected for instruction

I.4 an examination of the job analysis, task selection and job performance measures for any existing instruction to determine if these courses are usable in whole or in part

I.5 selection of the instructional setting for tasks selected for instruction

Phase II, Design

Beginning with this phase the model is concerned with designing instruction using the outputs from phase I. The first step is the conversion of each task selected for instruction into a terminal learning objective. Job performance measures provide the basis for developing these terminal learning objectives. Learning objectives (both terminal and enabling) describe the knowledge and skills that must be mastered by the student. They are the common three part objective that provides a statement of the behavioral actions, performance conditions and attainment standards which can be measured. Learning objectives can be effectively developed to support all four categories of learning: 1) mental skill, 2) information/ knowledge, 3) physical/manual skill, and 4) attitude.

Terminal learning objectives are analyzed and broken down into their component parts called enabling objectives. Enabling objectives provide the level of detail necessary to describe the major components that must be learned in order to perform a terminal objective. They are written with conditions and standards appropriate to the instructional environment. Learning objectives are necessary to bridge the gap between performing a task under job conditions and learning how to perform that task in an instructional setting. Precisely stated learning objectives define for the student, instructor, curriculum developer and test writer exactly what is required of them.

After all the learning objectives have been prepared, test items to measure student attainment are written. These test items are called criterion referenced measures because they test against the criteria for successful performance that were identified in the objectives. With a criterion referenced measure, students are rated on their ability to achieve the objectives. How others score on a test has no bearing on an

individual's grade. Test items are written for each of the four categories of learning, making sure that all significant features of what has to be learned are represented in the test. Sufficient items should be written on all learning objectives to allow for alternative forms of a test in order to facilitate retesting. The grouping of test items into pre-tests, progress tests and a post-test is done in block II.4.

Once the test items have been developed, those that were designed for lower level enabling objectives should be administered to a representative sample of the student population, in the form of an entry level test, to measure entry level behavior. Entry level behavior includes the skills, knowledge and attitudes students possess at the time they report for instruction. Assumptions concerning the entry level behaviors will be verified or adjusted according to test results. When the test(s) show that some of the enabling objectives upon which the test items are based have already been mastered by the students, those enabling objectives and their corresponding test items should be deleted from the course. Whenever the test(s) indicate that students lack the minimum prerequisite knowledge and skills, additional enabling objectives and test items must be developed to cover the gap between entry level assumptions made in block II.1 and the true entry level required for the course. If the test(s) accurately measure the students' entry level behavior, it is unnecessary to modify existing enabling objectives and test items.[2]

Finally, the refined list of learning objectives, both terminal and enabling, are sorted, sequenced and grouped. This is done in order to

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[2]Results for each test item will probably show that some students already know the material while others do not. It is very unlikely that everyone tested will either know all of the material or not know it. Therefore, in establishing an entry level for a group paced course, curriculum developers must use their best judgment in determining the exact level of instruction at which to begin the course.

help students make the transition from one skill or body of knowledge to another and assure that supporting skills and knowledge are acquired before dependent performance requirements or subject matters are introduced. Proper sequencing of objectives for instruction will help produce the most learning in the shortest period of time. The optimal sequence is the one that works best for students. Because test items measure specific learning objectives, they are structured at the same time as the learning objectives. This greatly facilitates the grouping of test items into pre-tests, progress tests and a post-test.

The sequence of events in the design phase is illustrated in Figure 3. The products of each event are also provided.

EVENTS:

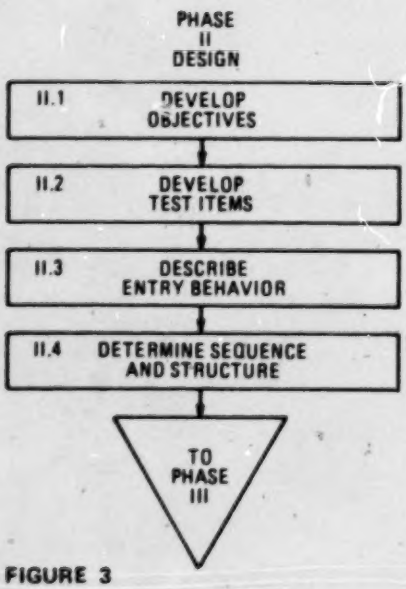

FIGURE 3

PRODUCTS:

II.1 learning objectives, both terminal and enabling

II.2 a pool of criterion referenced test items which measure each learning objective

II.3 test(s) to establish student entry behaviors and, when necessary, revisions to learning objectives and test items based on true entry levels

II.4 a list of sequenced and structured learning objectives

Phase III, Develop

The instructional development phase begins by identifying the learning activities which must take place in order to produce the desired learning outcomes. The purposes of block III.1 are to: 1) classify the learning objectives according to the appropriate learning categories and sub-categories (see Appendix A for a list of categories and sub-categories) 2) identify for each sub-category, those learning guidelines necessary for optimum learning to take place, and 3) specify activities that must take place in the learning environment to provide instruction directly related to task performance.

There are four learning guidelines which seem to apply to most if not all of the learning categories. These guidelines are listed and described in Appendix A. It should be noted that each learning sub-category does not require all or the same learning guidelines for optimum learning to take place. The purpose here then is to select those guidelines which best enable the student to master the learning objective. Based on the learning guidelines selected, as well as the learning objectives and test items, it is possible to identify what the instructor or instructional materials must do to teach a student to perform the learning objectives and also what the student must do to show mastery of the subject matter.

The procedures in block III.2 involve two principal steps. Step one is the specification of an instructional delivery system which provides the most efficient and effective combination of instructional methods, media and organizational system to accomplish the terminal objectives. However, since there is no single best method of teaching which applies to all learning situations or objectives, the instructional delivery system will normally include a combination of teaching methods, selected instructional media and a system of organizing students and instructors to accomp-

lish an objective. The selection of one delivery system over another, therefore, is made on the basis of careful analysis of the instructional situation from several standpoints: 1) learning objectives, 2) course content, 3) student population, 4) instructional staff, 5) space, 6) equipment and facility constraints, 7) instructional materials, 8) time and 9) costs. Consequently, the instructional delivery system must be compatible with the learning objectives selected in block II.1, the learning activities selected in block III.1 and any other significant inputs from previous blocks in the model.

The second principal step is the preparation of an instructional management plan which is a set of procedures used to assure a smooth flow of students through the instructional system. This plan indicates exactly how the course is to be conducted, how the students are to be managed, when and where they will be tested, what the instructors and other support personnel are to do and how each of the many elements within the plan work together.

Developing instructional materials is both costly and time consuming. Therefore, it is essential to search out and consider the usefulness of existing materials before committing resources to the development of new instructional materials. Candidate materials should be reviewed to see whether they meet the learning objectives and whether they can be used or adapted for use within the context of student characteristics and the selected learning guidelines as well as methods and media identified in block III.2.

In block II.1, learning objectives were derived for each task selected for instruction. In block III.1, specific learning guidelines and learning activities were identified that require different instructional treatment. From block III.2 the media and methods of instruction have been

specified and from block III.3 the acceptable off-the-shelf instructional materials have been collected and assembled. At this point all the preceding analysis and planning will be utilized to produce the necessary additional instructional materials.

The production process includes developing first draft materials using the learning activities specified in block III.1. These first draft materials are tried on students and finally sent to the appropriate production specialists for development. A variety of approaches are available for use. The appropriate mix of these approaches will depend in large part on the available time and the facilities and resources available locally. Lectures, video tapes, slide/tape presentations, job performance aids, and formal on-the-job training are all developed according to the same general principles. The prescribed procedures allow for ample internal content review of the materials to insure that they are doctrinally correct.

The heart of the development phase is validating the instructional materials until the students who use them as planned meet the learning objectives.

If the instructional materials selected in block III.3 and those developed in block III.4 have been produced efficiently, they will have the minimum possible elaboration. The instruction should be "lean." When this material is tried on students for the first time, it should reveal some short-comings. Students ordinarily will find errors in the directions or will fail to understand or be able to meet some of the requirements. These inadequacies can be corrected through the process of revision. If, on the other hand, tryout reveals only a few errors and difficulties, and students seem to grasp everything quickly, it will be extremely difficult to discover if the instruction has been overdone.

Selected members of the target population usually go through the materials individually at first and revisions are made on the basis of those trials. Following the initial revision based on individual student data, the number of students is increased in order to detect more possible errors. Finally, when the materials are thought to be complete, they are tested on enough students so that their effectiveness can be demonstrated at an acceptable level of confidence.

As the materials get better, fewer and fewer students will have difficulties, and more and more students will work through them to an acceptable level of performance. At this point the instructional materials are ready for quantity reproduction and implementation.

Figure 4 illustrates the sequence of events in the development phase. Event products are listed alongside the chart.

EVENTS:

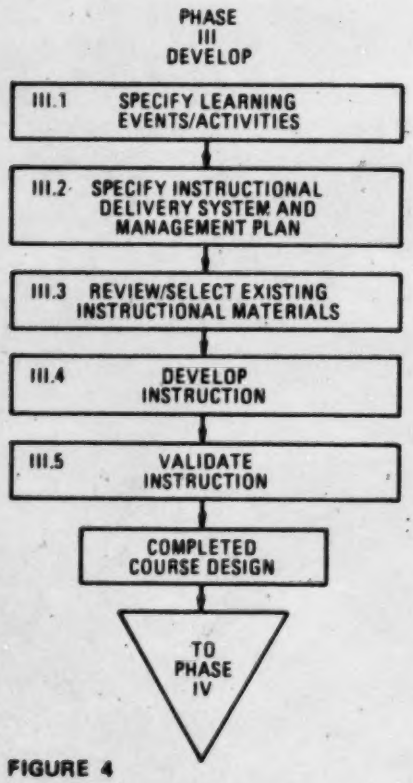

FIGURE 4

PRODUCTS:

III.1 the classification of learning objectives by learning category and sub-category as well as the determination of appropriate learning guidelines and activities

III.2 an instructional delivery system and supporting media as well as the instructional management plan for conducting the instruction

III.3 selected existing instructional materials adequate for use and materials which must be revised before use

III.4 the development of instructional materials for all objectives where existing materials are not available

III.5 validated instructional materials

Phase IV, Implement

The implementation of the instructional management plan is the terminal step in planning and preparation and occurs just before instruction begins. It is at this point that any discrepancies or deficiencies in the materials, procedures, tests and other necessary components of the total instructional program are identified and corrected. It is also necessary at this time to select, assign and train instructors and other key personnel in any of the techniques or procedures with which they are not familiar. The emphasis is on assuring that the right people are at the right place at the right time, that they know what they are supposed to do, and that they have the materials, equipment, facilities and other resources to do it.

A complete instructional package containing learning objectives, tests, instructional materials/instructional management and a trained staff should now be available. What remains to be done is to conduct instruction in accordance with the procedures and documentation contained in the instructional management plan. As part of the instructional activity, required changes and other observations are documented. Records are also kept on evaluative data and problems students have with instructional materials. At the completion of each course cycle, the collected information should be used to improve instruction for the succeeding cycle.

The sequence of events for the implementation phase is shown in Figure 5. Event outcomes are also listed in terms of products.

EVENTS:

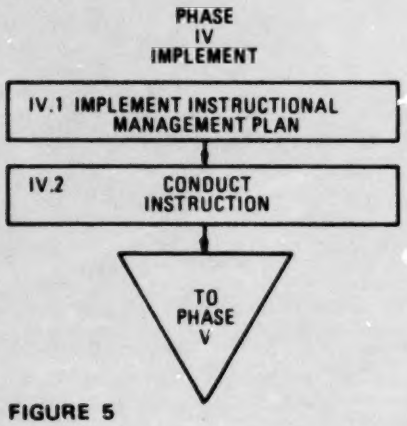

FIGURE 5

PRODUCTS:

IV.1 documents containing information on time, space, student and instructional resources and staff trained to conduct the instruction

IV.2 a completed cycle of instruction with information needed to improve it for the succeeding cycle

Phase V, Control

This phase provides for the evaluation and revision of instruction. The first activity, internal evaluation, is conducted to determine if the instruction is providing students with the necessary knowledge and skills to meet the learning objectives developed in block II.1. This is done by assessing student test performance and evaluating the effectiveness of instructional materials, media and methods. The internal evaluation process consists of collecting pertinent performance, progress and process data and information from students, instructors and other informed personnel, evaluating this data and making recommendations.

There are two purposes for conducting an external evaluation: 1) to determine whether graduates can perform on the job at the planned level of proficiency, the tasks in which they received instruction, and 2) to determine whether the tasks taught are in fact the tasks required on the job. In a sense this revalidates the original task list. External feedback is obtained by following graduates into the field either physically or by questionnaire. Performance is then determined by job performance measures, produced in block I.3, with supervisors' evaluations taken into account. As with internal evaluation, external evaluation is a continuous process which identifies problems and recommendations for improvements/revisions to instruction.

The final function in the ISD process is that of maintaining quality control of the instructional program through the process of revision. Since a considerable amount of effort has gone into the design and development of an instructional program, the decision about what to revise, if at all, should be made only after careful analysis of the inputs from blocks V.1 and V.2. Generally, revision means those changes made in the procedures,

techniques and materials in the program. The emphasis is on change of technique rather than of content, doctrine, or curriculum.

Figure 6 shows the sequence of events for the evaluation and quality control phase. Event products are also listed.

EVENTS:

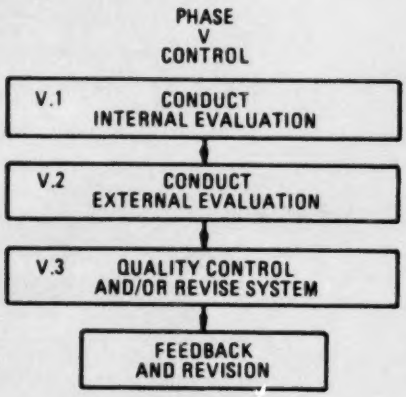

FIGURE 6

PRODUCTS:

V.1 a report on evaluation findings, their interpretation and recommendations for revisions

V.2 a report on the evaluation procedures, findings, interpretation and revision recommendations

V.3 instructional program revised on basis of empirical data

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Appendix A

LEARNING CATEGORIES AND SUB-CATEGORIES

Learning Categories	Learning Sub-Categories
I. Mental skill	1. Rule learning and using
	2. Classifying-recognizing patterns
	3. Identifying symbols
	4. Detecting
	5. Making decisions
II. Information/knowledge	6. Recalling bodies of knowledge
III. Physical/manual skill	7. Performing gross motor skills
	8. Steering and guiding-continuous movement
	9. Positioning movement and recalling procedures
	10. Voice communicating
IV. Attitude	11. Attitude learning

Source: NAVEDTRA 106A, Phase III Develop, p. 11

LEARNING GUIDELINES

1. Inform Student(s) of Learning Objectives. At the beginning of each lesson the instructor will state the terminal objective. The learning objectives will also be specified in written materials.

2. Provide for Active Student Practice. Whenever possible, write learning activities that call for active responses from the student(s). Have them do something to show they understand the subject matter.

3. Provide Guidance and Prompts to Student. Give student(s) sufficient examples of what to do and explanations of how to do it so that they know what is expected of them.

4. Provide Student(s) with Feedback. Tests should be used as teaching tools by fairly testing the subject matter taught and by providing the student(s) with either reinforcement for correct answers or an explanation of their mistakes. Regular classwork should also be written to provide the students with feedback on their performance.

Source: NAVEDTRA 110, p. 105

Appendix B

GLOSSARY

It is the aim of this alphabetical glossary to provide a source for arriving at some common understanding of terminology which will facilitate more exacting communication.

ABSOLUTE STANDARDS: A statement defining the exact level of performance required of a student as a demonstration that he has mastered the course objective(s). Criterion-referenced tests are usually based on an absolute standard.

ACHIEVING GROUPING: Arrangement whereby students are assigned to groups according to their performance on pretests of units of the course.

ACTION VERBS: Verbs that convey action and reflect the type of learning that is to occur. Action verbs must reflect behaviors that are measurable, observable, verifiable and reliable.

ASSESSMENT: A judgment of the effectiveness and efficiency of a training system, in terms of measurement and evaluation.

ATTITUDE: A persisting state of a person that influences his choice of action.

AUDIOVISUAL AID: Any static or dynamic demonstrative training aid utilized to facilitate and reinforce learning through one or both of the physical senses of sight and hearing.

AUDIOVISUAL EQUIPMENT: Equipment used for the recording, production, processing and exhibition of audiovisual products.

AUDIOVISUAL MEDIA: Refers to any media such as videotape or film which is both seen and heard.

BASELINE DATA: Valid and reliable information about the current level of performance of the intended student population. This data can be used to confirm the need to develop new instruction, or can be used as a comparison in ascertaining differences between students' performance before and after instruction.

BEHAVIOR: A student's visable action, performance, operation or product which can be classified or labeled by an observer according to specific and discrete criteria.

CONDITIONS: Occurs in terminal objectives; describes what is presented to the student in order to accomplish the specified action, that is, it describes the important aspects of the performance environment.

COURSE DOCUMENTATION: Information describing the current content of a course (instructional materials, tests, instructor's manual, evaluation plan, student's manual) and its developmental history (job analysis, criteria for selecting tasks for training, previous revisions).

COURSE OBJECTIVE: A description of the ultimate purpose of the course, including a statement of who is to be trained, what he is to be trained to do, the degree of qualification brought about by the training, and where and under what general conditions the graduate will perform on the job.

CRITERION-REFERENCED TEST: Measures what an individual can do or knows, compared to what he must be able to do or must know in order to successfully perform a task. Here an individual's performance is compared to external criteria or performance standards which are derived from an analysis of what is required to do a particular task.

CRITICAL SEQUENCE: Sequencing of topics or objectives according to their importance.

DATA: Collection of facts or numerical values resulting from observations of situations, objects, or people.

ENABLING OBJECTIVE: A three-part objective that helps the student achieve a terminal objective. It describes the behavioral actions, the performance conditions, and the attainment standard expected of the student when he completes the task.

ENTRY BEHAVIOR: The skill, knowledge and/or attitude required before beginning a new segment of instruciton; also may refer to the capability a person has prior to new learning.

ENTRY SKILLS: Specific, measurable behaviors that have been determined through the process of analysis of learning requirements to be basic to subsequent knowledge or skill in the course.

ENTRY SKILLS TEST: A measurement instrument designed to determine if a student already possesses certain skills or knowledge needed as a prerequisite before undertaking new instruction.

ENTRY TEST: Contains items based on the objectives that the intended students must have mastered in order to begin the course.

EVALUATION: The process of interpreting the results of measurement data (e.g., tests, JPMs) for the purpose of making a judgment or decision on the instruction or on the success of a trainee.

EVALUATION PLAN: A method of outline of what set of procedures will be used to gather data and information for the purpose of assessing a course of instruction.

FEEDBACK: The return of information. Information on student performance is "fed" back to the student so that he can improve that performance; to the instructional designer so that he can improve materials and procedures on the basis of student needs; to the management system so it can monitor the internal and external integrity of the instruction and make appropriate revisions. Or, refers to the flow of data or information from one step in the ISD Model to others.

FOLLOW-UP ACTIVITIES: The work events that occur after a course of instruction has been completed.

FORMATIVE EVALUATION: The iterative process of developing and improving instructional materials and procedures.

FRONT END ANALYSIS: Refers to job analysis, selection of tasks for training, and development of JPMs.

GO NO-GO: Pass-fail; criterion of evaluation whereby student cannot be "partially correct." He is either 100% correct (go) or incorrect (no-go).

INDEPENDENT RELATIONSHIP: Occurs when skills and knowledges in one objective are unrelated to those in the other objective. Mastering one of the objectives does not simplify the other.

INDIVIDUALIZED INSTRUCTION: Refers, in the ISD Model, to a management scheme which permits individual characteristics of trainees to be a major determinant of the kind and amount of instruction given. Here, it nearly always implies some form of self-pacing.

INSTRUCTIONAL STRATEGIES: Methods of presentation, practice and evaluation specifying the ways in which the desired learning outcomes are to be achieved in the instructional setting (e.g., tutorial, lecture/discussion, demonstration, etc.).

INSTRUCTIONAL UNIT: An assembly of lessons which have been integrated, either to complete a usable bit of knowledge or skill, or to aid in scheduling a course or program. The basic components of courses. Same as "Unit of Instruction."

INTERNAL EVALUATION: Assessment of the effectiveness of an instructional program in terms of student performance on stated terminal objectives.

JOB: The duties and tasks performed by a single worker constitute his job. If identical duties and tasks are performed by several individuals, they all hold the same job. The job is the basic unit used in carrying out the personnel actions of selection, training, classification and assignment.

JOB ANALYSIS: The basic method used to obtain a detailed listing of duties, tasks, and elements necessary to perform a clearly defined, specific job, involving observations of workers and conversations with those who know the job, in order to describe in detail the work involved, including conditions and standards.

JOB PERFORMANCE MEASURES: Tests that are used to evaluate proficiency of a job holder on each task he performs.

JOB SHEET: An instruction sheet which provides for the individual student a list of the principal steps to be taken in doing a job in the order in which they are to be done. Job sheets also provide the student with the objective(s) to be accomplished and list the references, equipment, and materials required.

KNOWLEDGE: Specific information or facts required to develop the skills and desired attitudes to effectively accomplish prescribed jobs, duties and tasks.

LEARNER CHARACTERISTICS: The traits possessed by learners that could affect their ability to learn (e.g., age, I.Q., reading level, etc.)

LEARNING ANALYSIS: A procedure to identify subelements that must be learned before a person can achieve mastery of the performance.

LEARNING CATEGORY: A division of learning behavior. All learning may be classified into one of four learning categories: mental skill, physical skill, information, or attitude.

LEARNING HIERARCHY: Graphically portrays the relationships among learning tasks in which some tasks must be mastered before others can be learned.

LEARNING STEP: Occurs when enabling objectives are broken down into smaller parts.

LESSON GUIDE: An organized outline of a single lesson topic taken from the course of study and serving as a blueprint of what is to be accomplished in class. It is complete in detail and states all objectives, topics, subtopics, references, training aids, methods, procedures, and other supplemental information as needed. In general, the lesson guide is the formal lesson plan.

MANAGEMENT PLAN: Program for the assignment, monitoring, and assessment of the personnel, materials and resources dedicated to a specific mission, operation, or function.

MASTERY: In terms of learning, refers to meeting all of the specified minimum requirements for a specific performance. Criteria for mastery are defined in the design phase of the ISD Model.

METHODS: The means, techniques, procedures, etc., of instruction. There are many methods appropriate for use. Included may be such processes as lecture, recitation, practical application, examination, study periods, demonstrations, use of training aids, group discussions, reviews, demonstation-performance, panel discussions, role playing, case studies, craftsman, programed instruction, and coach and pupil methods.

MEDIA: Means for presenting instructional material to learners; for example, books, audiotapes, and filmstrips.

MEDIA SELECTION: Is the major means of determining how instruction is to be packaged and presented to the student.

MODULE: An individually self-instructional package usually containing all the necessary materials a learner needs to meet some or part of a terminal objective.

MULTIMEDIA PACKAGE: Self-contained instructional unit in more than one medium.

ON-THE-JOB-TRAINING (OJT): A program of training designed specifically to train an individual, without the necessity for interrupting his performance of daily assigned duties relative to his work assignment. OJT programs may range in complexity from those designed to train an entry level student to become fully qualified in the case of simple tasks, to programs designed to take an individual who possesses the fundamental principles required to understand the tasks from this level to that of an individual who is fully qualified to perform all the tasks and duties of his position without assistance.

OVERLEARNING: Refers to the continual practice on a learning task by a person who has correctly performed the task.

PEER TUTORING: A form of instruction in which students at the same or more advanced level of knowledge provide instruction to students at the same or lower level of knowledge on the specific objectives under consideration.

PERFORMANCE MEASURES: The absolute standard by which a job performance is judged. A performance measure is the inventory of job tasks with each performance objective.

PERFORMANCE TEST: A sample work situation in which personnel being tested perform a practical task which requires them to demonstrate how well they have mastered the skills required for the performance of their job. For some circumstances this could be a written test if designed as a job sample for personnel whose responsibilities involve only paper procedures.

POST-TEST: A test administered after the completion of instruction to assess whether a student has mastered the objectives of the course or unit.

PRE-TEST: Administered prior to instruction to determine how much the student already knows.

PROGRESS TESTS: Short examinations administered daily or weekly throughout the course to evaluate student progress.

QUALITY CONTROL: Process of measuring and evaluating in order to maintain course standards through adjustments in instructional materials or procedures.

RELIABILITY: The consistency with which a test measures the amount of student achievement.

SAMPLE: A portion or small segment of the students for whom instruction is designed.

SELF PACING: Mode of instruction whereby each student works through the instructional materials at his own rate of speed.

SEQUENCING: Ordering instruction; proper sequencing allows the learner to make the transition from one skill or body of knowledge to another, and assures that supporting skills and knowledge are acquired before dependent performances are introduced.

SKILL: The ability to perform a job-related activity which contributes to the effective performance of a task.

STANDARDS: Occurs in terminal and enabling objectives; describes the criterion or standard of performance which must be attained.

SUBJECT MATTER EXPERT: A person who has professional skill in the performance of some job and who is consulted by an instructional designer in the process of job task analysis.

SYSTEMS APPROACH: A generic term referring to the orderly process of analysis, design, development, evaluation, revision, and operation of a collection of interrelated elements.

TARGET POPULATION: The pool of potential entrants to training for which instructional materials are designed and tried out.

TERMINAL OBJECTIVE: A three-part objective expressed in terms of and keyed to tasks as listed in the Training Analysis Summary that helps the student achieve the course objective. It describes the behavioral actions, the performance conditions, and the attainment standard expected of the student when he completes the task.

TRADE-OFFS: In any systematic approach to instruction, it is necessary to make compromises between what is desirable and what is possible. Ordinarily, these decisions involve increase or decreases in time, money, facilities, equipment, or personnel. Training aids and simulators represent examples of trade-offs.

TRYOUT: Practice test; the purpose is to make the tryout as realistic as possible by eliminating as many sources of unreliability as possible.

UNDERTRAIN: Provide inadequate training that does not prepare a student to meet regular job performance requirements.